

Rumphius which is probably incorrect, as Rumphius calls his species *Lithodendrum saccharaceum rubrum*.
Color violet.

Distichopora gracilis, Dana, loc. cit. Color pale rose.

coccinea, Gray, Proc. Zool. Soc., 1860, p. 244. Color blood red with yellow tips.

**rosea*, Saville-Kent, Proc. Zool. Soc., 1871, p. 281. Color deep rose carmine.

livida, nobis. Color livid with orange pores.

I have never seen Dana's species, but the others are common, *D. coccinea* especially.

I am at present engaged on a review of the whole genus, including its bibliography, which I hope to publish shortly. A marked difference between the present species and *D. coccinea* is that the latter has a small line of branchlets projecting at right angles from the main stem, while the stems of *D. livida* are smooth.

NOTES ON THE ANATOMY OF BIRDS.

BY WILLIAM A. HASWELL, M.A., B.Sc.

II.—THE LUMBAR AND SACRAL PLEXUSES OF NERVES.*

The *lumbar plexus* is constituted by the three last lumbar nerves.† From the cord formed by the junction of the antepenultimate and

* In a previous paper on the anatomy of the brachial plexus (Pro. Linn. Soc., N.S.W., Vol. III. p. 409.) I omitted to mention, (1.) that the specialised cutaneous muscle named *expansor secundariorum* by Mr. A. H. Garrod is supplied by a branch from the *internal cutaneous nerve*; (2.) that a special slender twig to the *coraco-sternalis* originates from the second nerve of the plexus.

† The determination of the posterior vertebræ—as *lumbar*, *sacral* or *caudal*—is made to depend on their relations to the nerves. There is a difficulty in applying this test to the distinguishing of the posterior cervical and anterior dorsal vertebræ—the relations of the nerves of the brachial plexus to the first vertebra bearing a movable rib being quite inconstant.

penultimate lumbar the *long saphenous* and *obturator nerves* take origin. This cord is then joined by the last lumbar to form the *femoral* or *anterior crural nerve*.

The *obturator nerve*, after giving off a branch to the obturator internus muscle, passes through the foramen ovale, and finally ends in the substance of the adductor magnus.

The *femoral nerve* gives off branches to the glutei, the sartorius, the vastus externus, the rectus femoris, the pectineus (*ambiens*), and adductor magnus, in addition to cutaneous branches to the inner side of the thigh and leg.

The *sacral plexus* is formed by the sacral nerves with a branch (*lumbo-sacral cord*) for the last lumbar. The lumbo-sacral cord and the first three sacral nerves join to form a stout anterior cord from which the nerve to the quadratus femoris * (and gemellus?) is derived. The two last sacral nerves join and give off a tolerably large branch before joining the anterior cord. The main trunk formed by the junction of the anterior and posterior cords of the plexus, sooner or later divides into two distinct fasciculi—the *sciatic nerves*—which run down the back of the thigh close together.

The branch given off by the posterior cord of the plexus courses over the obturator externus muscle, and then passes between the biceps, adductores longus and brevis above, and the adductor magnus below, at which point it breaks up into branches of supply for the semitendinosus, semimembranosus, adductor brevis and adductor longus, in addition to some cutaneous branches, and a slender nerve which runs backwards to the tail, usually joining one of the caudal nerves.

*The muscle here named *quadratus femoris* has been sometimes regarded as the equivalent of the *obturator externus*; its nerve supply, taken in connection with its ischial origin, would seem to indicate that the former view of its homology is the correct one,

The *sciatic nerves* run parallel with the sciatic artery down the thigh. The *internal sciatic nerve* gives off, while in the thigh, a long cutaneous branch to the outside of the leg; it then sends off a communicating branch to the external popliteal nerve, and a little lower down gives off a branch which runs down to the ham, where it bifurcates—one division ending in the gastrocnemius externus, the other passing deeper to supply the flexor perforatus secundus secundi digiti and flexor perforatus secundus tertii digiti. Soon afterwards the main trunk (*internal popliteal nerve*) bifurcates; the outer branch breaks up into numerous twigs for the supply of the inner group of superficial flexors of the toes; the inner sends off (1) a long slender twig which passes down the leg on the surface of the flexor profundus digitorum, and the flexor longus hallucis, and afterwards in contact with the tibia to the ankle, where it becomes cutaneous; (2) branches of supply for the gastrocnemius internus and tibialis posticus muscles; (3) branches to the flexor longus hallucis and flexor profundus digitorum.

The *external sciatic nerve (external popliteal)* gives off in the thigh a branch of supply for the biceps muscle. It subsequently gives origin to a long branch, which, (after passing with the main trunk of the nerve under the ligament of the biceps), runs down to the foot beneath the superficial flexor muscles. A series of branches then radiate from the main trunk of the nerve as it passes beneath the tendon of the biceps in the back of the leg; the first of these passes to the front of the leg, the next two or three supply the two outer superficial flexors, the peroneus longus, the extensor communis digitorum and the tibialis anticus. The main trunk finally divides into two branches which turn round the outside of the fibula to the front of the leg.

Of these, the outer runs superficially over the ankle-joint giving off in its course some small branches to the deeper structures on the front of the tarso-metatarsus, and finally divides at the base of the outer toe, supplying branches to both sides of that digit

and the outer side of the middle. The other, after passing under the ligament which binds down the tendon of the tibialis anticus to the tibia, divides into two branches, which again re-unite after one of them has perforated the tendon of the tibialis anticus close to its insertion; the nerve then again divides into several twigs of which one goes to supply the surface of the middle toe and the outer surface of the second, a second supplies the adjacent sides of the hallux and second, a third the inner side of the hallux and the inner surface of the tarso-metatarsus, while a fourth turns round the inner border of the latter bone and enters the sole.

III.—THE MYOLOGICAL CHARACTERS OF THE COLUMBIDÆ.

It is only of very late years that the characters afforded by the muscular system have been applied to throw light on the classification of Birds. Wiedemann (*Anatomie und Naturgeschichte der Vögel*, 1810.) was the first to call attention to some of the differences to be observed in the myology of the different orders. It was Prof. Sundewall, however, who first attempted to use the characters afforded by the myology for the furtherance of classification (*Brit. Assoc. Report*, 1855). Following in his footsteps Mr. A. H. Garrod (*Proc. Zool. Soc.*, 1873,) elaborated a scheme of classification based upon a consideration of the peculiarities exhibited by certain muscles of the thigh in the various orders and families, shewing the occurrence or non-occurrence of certain muscles of that region—posterior part of the *Tensor fasciæ*, the *Semitendinosus*, *Accessory Semitendinosus*, *Semimembranosus*, *Ambiens (Pectineus)*, *Femoro-caudal (Adductor longus)*, and *Accessory Femoro-caudal (Adductor brevis)*,—to be of great importance in working out a natural system of classification. The same author has also called attention in various memoirs to many other important points in the myology of the class.*

* *Vide*, e.g., "On the Disposition of the Deep Plantar Tendons in Different Birds," *Proc. Zool. Soc.* 1875, p.p. 339—348; "On some points in the Anatomy of the Columbæ," *P.Z.S.*, 1874 p.p. 249—259.

M. Edmond Alix in his "*Essai sur l'appareil locomoteur des Oiseaux*" (1874), in addition to a minute account of the muscular system in general, gives a description of the differences in the arrangement of the long flexors of the toes in various birds, and refers to a few other varieties in the Myology.

The present paper is intended as a slight contribution to our knowledge of this subject—consisting of a summary of the most important points ascertained by a study of the myology of the Pigeon family, a group whose anatomy appears to have been singularly neglected. In the anatomy of the muscles of which no mention is made in the following descriptions there is nothing specially characteristic to be observed.

a.—Muscles of the Anterior Extremity.

1.—The *latissimus dorsi*, in all the genera of the family which I have examined is specially remarkable on account of its being devoid of any trace of a posterior belly—a character in which, so far as I have ascertained, the Columbidae are distinguished from all other groups of birds (including the columbiform *Didunculus*).

2.—The *levator anguli scapulae* arises from the first three ribs, or the second, third and fourth, with their transverse processes, and is not connected with the transverse processes of the posterior dorsal vertebræ, as in most other birds.

3.—The *biceps flexor cubiti* arises as usual by two heads, a coracoidal and a humeral; these blend completely towards the middle of the arm; but there are two distinct tendons of insertion—one attached to the head of a radius, the other to the coronoid process of the ulna. This arrangement is not an uncommon one, and is found in widely differing genera (e.g. *Athene*, *Grallina*). It serves, however, as an important point of distinction from various families of birds: thus certain families (*Laridae*, *Chionidae*, *Scolopacidae*), have the muscle divided into two parts—corresponding to the coracoidal and humeral heads in the arrangement above described,—which remain separable from

origin to insertion; again in other cases (e.g., *Anatidæ* and *Gruidæ*), one of the terminal tendons is inserted into the head of the radius and the other bifurcates to become attached to both radius and ulna.

A further peculiarity of this muscle in the *Columbidæ* is that it gives off a broad quadrilateral offset to aid in the extension of the anterior alar fold. A vermiform muscle with a similar function and more intimately related to the biceps is to be found in most, if not all, Waders, and many Natatores (*Phalacrocorax*, *Larus*, *Anatidæ*), but *Didunculus strigirostris* is the only bird that resembles the *Columbidæ* in the flat expanded form of this *tensor accessorius* as it may conveniently be designated.

4.—The *tensor membranæ anterioris alae* consists of two separate muscles—the *tensor longus* and *tensor brevis*. The *tensor longus* has two distinct separate heads of origin; the one consists of a broad and flat fleshy belly, which takes origin from the approximated ends of the coracoid, scapula and clavicle,—chiefly from the coracoid—and arches over the shoulder-joint after the manner of the deltoid of mammals (to part of which muscle in fact it corresponds); distally it gives origin to the “elastic tendon” of the anterior alar fold; the other part of the muscle takes the form of a small cone-shaped prolongation of the *pectoralis major*. The *tensor brevis* may be described also as a small conical offset from the *pectoralis major*; it is however firmly connected with the pectoral ridge of the humerus. In some birds (e.g. *Larus*, *Bruchigavia*) the *tensor brevis* is represented only by a fasciculus of yellow elastic tissue; in others it is altogether absent. In the *Psittacidæ* again the *tensor longus* is not independent of the *pectoralis major*, and its tendon is connected by elastic fibres with the cervical muscles.

5.—The *extensor carpi radialis longior* and the *extensor metacarpi radialis* are so intimately blended as virtually to form one muscle. This is not an uncommon arrangement, being characteristic of

insessorial birds, and the nocturnal Raptores; it distinguishes these, however, from the wading and swimming orders, in which the bellies of these two muscles are separable from one another.

b.—Muscles of the Posterior Extremity.

1.—The *gluteus externus* is absent. This seems to be characteristic, besides the present group and its allies, of the Parrots, Kingfishers Cuckoos, and the Passerines.

2.—The *adductor brevis*, *adductor longus*, *semimembranosus*, *semitendinosus* and *accessory semitendinosus* are all present. The significance of these muscles has been pointed out by Mr. A. H. Garrod.*

3.—The *Ambiens* (*Pectineus*) and the *flexor perforatus digitorum* have a peculiar and characteristic arrangement in this family. In several genera of *Columbidæ* as Mr. Garrod has pointed out† the *ambiens* is altogether absent: where it is present, as occurs in the majority of genera, its tendon on reaching the back of the leg, in place of breaking up and losing itself among the fleshy fibres of the superficial flexors, maintains its consistency, and joins a strong tendon which, arising from the fibula, passes into a small muscular fasciculus—the accessory or fibular head of the *flexor perforatus secundus tertii digiti*. Such a definite relation of the distal tendon of the *ambiens* to one special muscle is rare, if not exclusively characteristic of the present group. In certain *Anseres* (*Erismatura*, *Casarca*) however, an arrangement which, though more complex, has a certain analogy with the above, is to be observed: here the tendon of the *ambiens* after becoming connected by a tendinous band with the head of the fibula, divides into three parts, each of which develops a little muscular slip becoming connected, one with the *flexor perforatus primus secundi digiti*, the

*“ On certain Muscles of the Thigh in Birds and their value in Classification,” P Z S, 1873, pp. 626—644, and 1874, pp. 111—123.

†“ On some points in the Anatomy of the Columbæ,” P.Z.S., 1874, pp. 249—259.

second with the *flexor perforatus primus tertii digiti*, and the third with the *flexor perforatus quarti digiti*.

4.—The tendon of the *flexor profundus digitorum* is united for a short distance in the sole, by means of tendinous fibres, with that of the *flexor longus hallucis*.

5.—A small muscle representing the *lumbricales* of mammals takes origin from the under surface of the tendons of the flexor profundus near the point where they separate, and divides anteriorly into two pointed processes, which become inserted into the proximal end of the cartilaginous sheath containing the flexor tendons of the second and third toes. This muscle seems to have hitherto escaped the notice of anatomists; so far as I have been able to ascertain it is peculiar to the Pigeons.

To sum up, the following are the points in the myology of the *Columbidæ* which seem to be specially characteristic of the family:—

1. The absence of a posterior belly of the *latissimus dorsi*.
2. The expanded form of the *tensor accessorius*.
3. The absence of the *gluteus externus* and the presence of the *adductores brevis et longus*, the *semitendinosus* and *semimembranosus*.
4. The special relation of the tendon of the ambiens (when present) to the fibular head of the *flexor perforatus secundus tertii digiti*.
5. The presence of *lumbricales* in the foot.

NOTES AND EXHIBITS.

ON EUKTIMINARIA DUCALIS.

BY THE REV. J. E. TENISON-WOODS, F.G.S., F.L.S.

In the Proceedings of this Society last year, I described (Vol. III., p. 126) what I considered to be a new genus of Polyzoa under the above name. I mentioned that similar fossils had been found in the chalk, and that M. d'Orbigny had suggested that